## Sect. 1.1

- Slope formula p.3 $m = \frac{y_2 - y_1}{x_2 - x_1}$
- Different forms of linear equations p.8
- parallel and perpendicular lines p.9

$y = mx + b$ (slope-int)

$y = m(x - x_1) + y_1$ (point-slope)

$Ax + By + C = 0$

$Ax + By = C$

## Sect. 1.2

- Functions – def. p.16 → one output for every input (vertical line test)
  – notation → $f(x) = x^2$ $f(7) = 49$
  $y = x^2$ what x gives $f(x) = 36$
  6, -6
- Domain/Range – independent/dependent
- Piecewise functions p.19

$$f(x) = \begin{cases} 3x - 4, & x < 4 \\ 4x + 1, & x > 4 \end{cases}$$

$f(4) =$ undef.

$f(0) = -4$

$f(5) = 21$

- Difference Quotient p.23

$3x - 6y = 12$

Find another equation $\parallel$ to and $\perp$ to the given equation through $(-2, -3)$

parallel

perpendicular

$y = m(x - x_1) + y_1$

$\frac{-6y}{-6} = \frac{12 - 3x}{-6}$

$y = -2 + \frac{1}{2}x$

$m = \frac{1}{2}$

original

$y = -2(x - -2) - 3$

$y = -2(x + 2) - 3$

$y = -2x - 4 - 3$

$y = -2x - 7$

$y = \frac{1}{2}(x - 2) - 3$

$y = \frac{1}{2}(x + 2) - 3$

$y = \frac{1}{2}x + 1 - 3$

$y = \frac{1}{2}x - 2$

same line

Given: $3x + 4y = 9$

Find $\parallel$ and $\perp$ through $(1, 4)$

$y = \frac{9}{4} - \frac{3}{4}x$ original, slope $-3/4$

parallel

$y = -3/4(x - 1) + 4$

$y = -3/4x + 3/4 + 4$

$y = -3/4x + \frac{19}{4}$

perpendicular

$y = \frac{4}{3}(x - 1) + 4$

$y = \frac{4}{3}x - 4/3 + 4$

$y = 4/3x + \frac{8}{3}$

# Difference Quotient

→ Lngmt to Santa Fe ≈ 300 miles

→ it takes me about 6 hours to get there

→ if I leave at 8:00am, how fast am I going at 10:00am?

50 mph

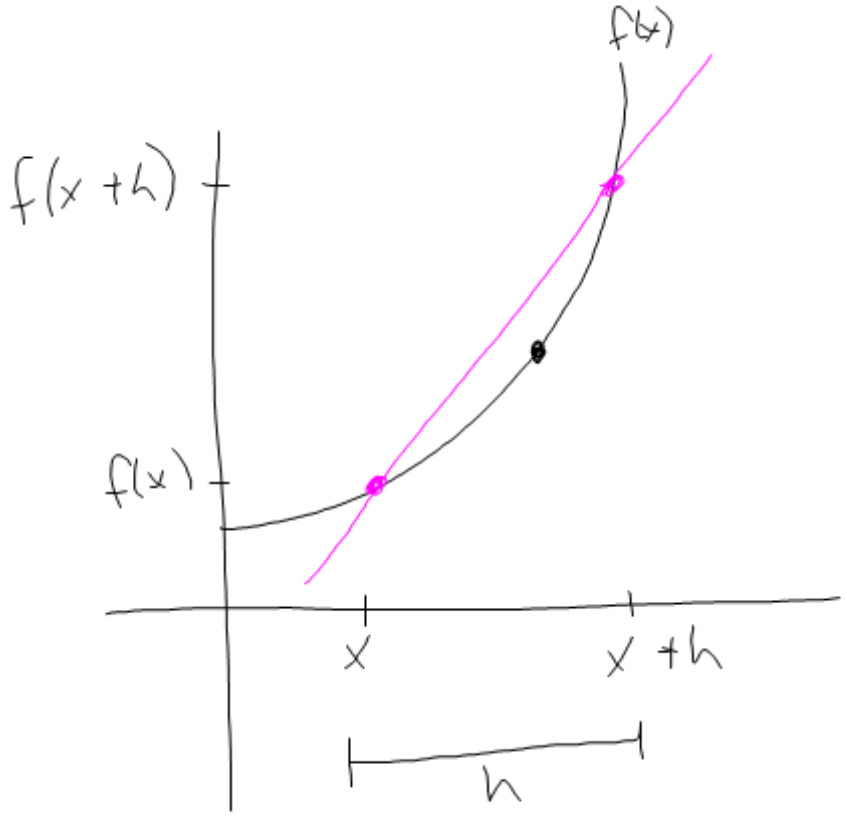
→ between 9:30am and 10:30am I cover 120 miles
how fast was I going at 10:00am? 120 mph

→ between 9:59am and 10:01am I cover 2.1 miles
how fast was I going at 10:00am? 63 mph

# Difference Quotient → finds the slope at a point

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{f(x+h) - f(x)}{h}$$



$$m = \frac{f(x+h) - f(x)}{h}$$

$$f(x) = 3x^2 + 5x$$

$$f(x+h) = 3(x+h)^2 + 5(x+h)$$

$$= 3(x+h)(x+h) + 5(x+h)$$

$$= 3(x^2 + 2xh + h^2) + 5(x+h)$$

$$f(x+h) = 3x^2 + 6xh + 3h^2 + 5x + 5h$$

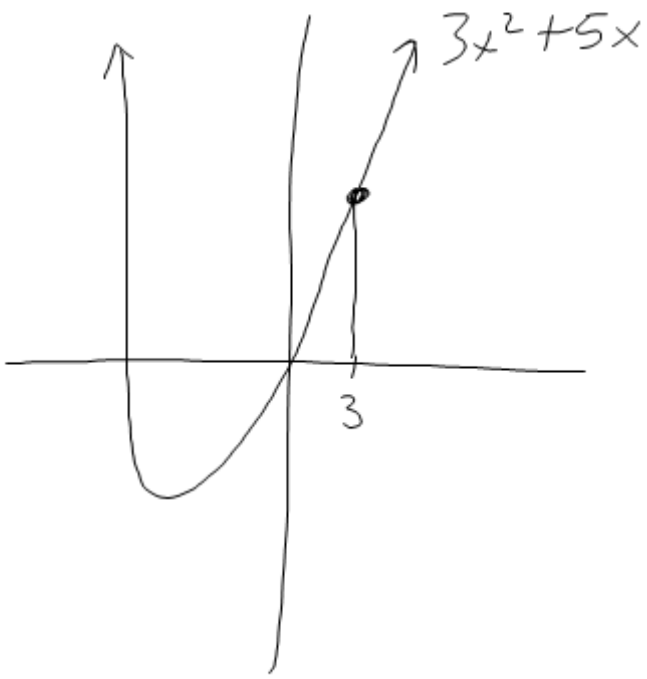
$$m = \frac{f(x+h) - f(x)}{h}$$

$$m = \frac{3x^2 + 6xh + 3h^2 + 5x + 5h - (3x^2 + 5x)}{h}$$

$$m = \frac{6xh + 3h^2 + 5h}{h} = \frac{6xh}{h} + \frac{3h^2}{h} + \frac{5h}{h}$$

$$m = 6x + 3h + 5$$

example, slope at $x = 3$ $\Rightarrow 6(3) + 5 = 23$


$3x^2+5x$
3

p. 83

#47, 48

(#48) $f(x) = x^3 - 5x^2 + x$

$f(x+h) = (x+h)^3 - 5(x+h)^2 + (x+h)$

$(x+h)(x+h)(x+h)$

$(x^2 + 2xh + h^2)(x+h)$

$x^3 + 2x^2h + xh^2 + x^2h + 2xh^2 + h^3$

$= x^3 + 3x^2h + 3xh^2 + h^3 - 5(x^2 + 2xh + h^2) + x + h$

$= x^3 + 3x^2h + 3xh^2 + h^3 - 5x^2 - 10xh - 5h^2 + x + h$

$$= \frac{x^3 + 3x^2h + 3xh^2 + h^3 - 5x^2 - 10xh - 5h^2 + x + h - (x^3 - 5x^2 + x)}{h}$$

$m = 3x^2 + 3xh + h^2 - 10x - 5h + 1$

$= 3x^2 - 10x + 1 + 3xh + h^2 - 5h$

Sect. 1.3

#11–19, 29, 31, 44, 47, 49, 51, 55